Prevention of

TERMITE DAMAGE

to Buildings

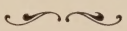
Preface

In presenting this pamphlet to the public, it is hoped that the following thoughts will be kept clearly in mind:

(1) That Wood has always been—and it still is—the best adaptable material for general construction use. It may be shaped, finished, expanded or remodeled to any desired need, and it also possesses natural beauty of grain design;

(2) That Termites, Decay and other destructive agencies are not new menaces. They have always existed and probably always will;

(3) That Treatment, by proper pressure methods, with Creosote Oil, Wolman Salts or Chromated Zinc Chloride will give protection against Decay, Termite Attack and other exposures.



(*The information given in this pamphlet was derived largely from publications and statements issued by the United States Bureau of Entomology.*)

For Government publications see:

U. S. Department of Agriculture, Farmer's Bulletin No. 1472.

U. S. Department of Agriculture, Leaflet No. 101. Obtainable from Superintendent of Documents, Washington, D. C.

For detailed information see:

OUR ENEMY THE TERMITE, by Thomas E. Snyder. Obtainable from Comstock Publishing Company, Ithaca, N. Y.

Or address any of our listed sales offices.

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THERE are fifty-six (56) species of termites in this country. These may be classified into two general types, the subterranean and non-subterranean. Both kinds exist in the extreme Southern, (Gulf Coast Regions) the Southwestern and Pacific Coast Regions. Elsewhere only the subterranean kind have been found. This type is the most common and is the only one considered herein.

Subterranean termites build their nests or colonies in the ground or in wood, live or dead, in contact with the ground. In these nests both wingless and winged adults are produced. The winged adults of both sexes emerge to swarm once each year, usually early in the Spring. At that time they mate, lose their wings, enter holes or cracks in the earth or in wood and start a new colony. The female soon lays eggs from which "nymphs" are hatched. These nymphs develop into two types of adult termites, sterile and fertile. Of the former, there are two types, the soldiers and the workers. There are three types of fertile adults, the original winged type, as the queen, and two other types which are wingless and never emerge from the colony, all having the power of reproduction. After a colony is started the number of individuals increase at an accelerating rate until tens of thousands may exist in that one colony. Many such colonies may exist in one structure.

The destructive forms of the subterranean termites are the white, wingless and blind workers. They shun light and are always concealed in the earth, in wood or in their shelter tubes. They require considerable moisture and consequently must maintain contact with the earth unless an artificial supply of water is available, as from a leaking water pipe.

Damage to buildings by termites is constantly becoming a more serious problem because remedial measures have not been generally adopted. Destruction by termites is estimated to involve a loss of forty million dollars ($40,000,000) annually. However, it is now recognized in modern construction that this problem should be considered. Wood *treated under pressure* with creosote or with certain salt preservatives is *termite-proof* and its liberal use together with proper construction methods will definitely prevent termite attack.

While damage to buildings by termites is serious, decay of wood in buildings causes far greater loss. It is recognized that untreated wood in contact with the

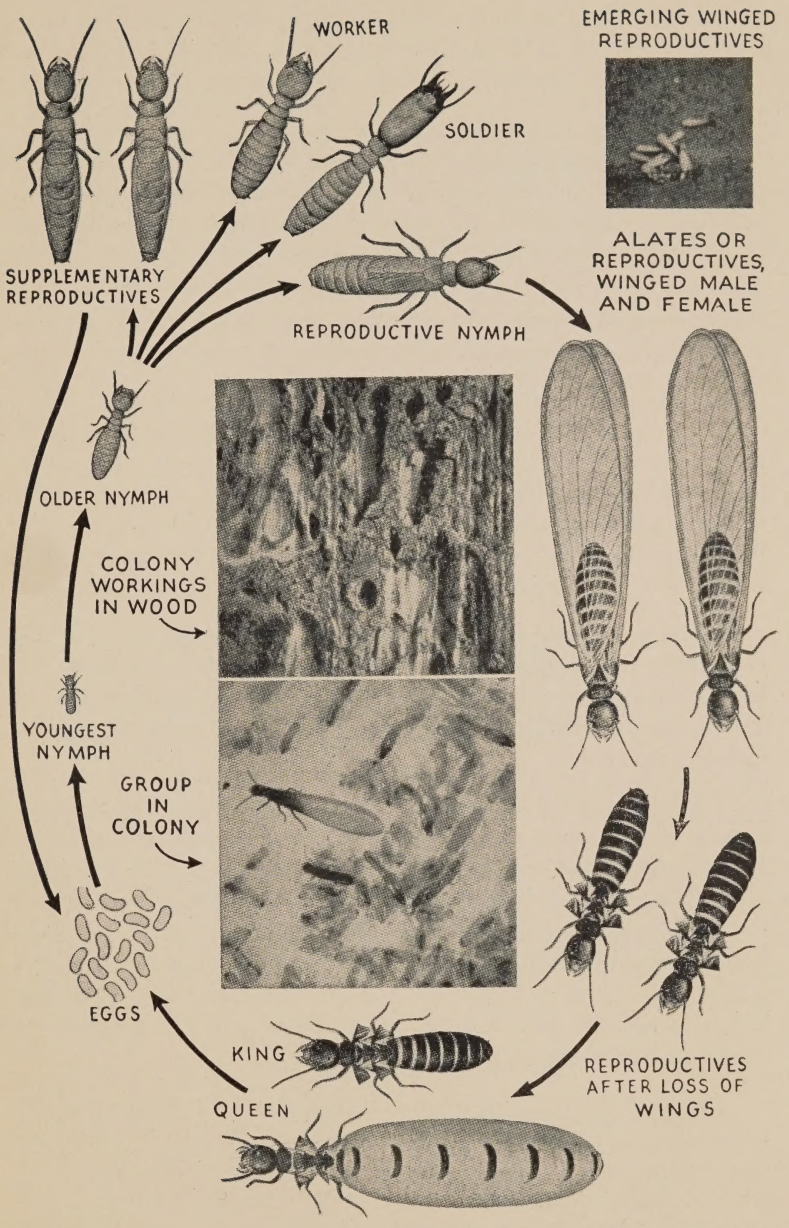
soil or subject to various other sources of moisture such as at joints and crevices in porches, is subject to decay. This knowledge has not reduced the utility of lumber but serves only to indicate proper care and use. It is also recognized that in such exposed installations, lumber must be treated with a preservative solution under pressure (not "pressure" sprayed) to give it practically permanent protection against decay.

So it is with termite attack, except that it is less general than decay and responsible for much less destruction of property. In some localities, wood in contact with the ground is subject to termite attack as well as to decay. In order to definitely prevent termite attack, lumber used in such places must likewise be treated under pressure in an effective preservative solution. *Lumber cannot be effectively protected against decay and termites by application of a pressure spray or by dipping in a preservative.* Such methods are at best temporary and are *generally ineffective.*

In recent years, many termite eradicating agencies have been established. Each agency features a special termite-toxic solution used as a spray or injected into bored holes in the lumber in buildings. Usually, the solution is featured as a deeply penetrating liquid which permeates all the wood killing all termites therein. Actually, any liquid sprayed on a wood surface even for appreciable lengths of time will be absorbed by a very shallow layer of the wood and no effective depth of penetration will result. Since termites work within the wood and not at the surface, such surface application of a solution will not exterminate them. If application is made by boring holes and injecting the solutions therein, the number of holes required to insure effective protection would probably cause serious weakening of the lumber and would usually entail more cost than the permanent and definite protection hereinafter described.

Damage to Structural Timbers by Subterranean Termites.

In some cases, termite eradicating agencies employ proper methods of repair or reconstruction to eliminate termites, but feature nevertheless the toxic solution as the major factor in the work. Where that is the case, proper protection (generally at excessive cost) may be obtained, but the use of the solution plays a very minor, if not useless, part.



(Courtesy, University of California Press, Publishers)

The Life Cycle of the Termite

Through extensive advertising by eradicating agencies, there has been gross exaggeration of the damage wrought by termites resulting in unjustified alarm in many localities. That situation developed to such an extent that the U. S. Department of Agriculture in 1931 felt obligated to issue a press bulletin warning home owners against such activities. That warning is quoted as follows:

"Home owners should beware of overdrawn and alarming reports of injury to building by termites or white ants, says the U. S. Department of Agriculture. In particular they should be wary when exaggerated statements of this kind form a part of the 'sales talk' for a 'termite treatment'. *Many of these treatments are expensive and are not correspondingly effective.* Reports to the Bureau of Entomology indicate that sharpers, overemphasizing the real injury that termites are likely to do, are filching from home owners hundreds of thousands of dollars and rendering little or no effective service in return.

"State officials and others reporting to the Bureau of Entomology reveal that the termite treatment sharpers are particularly active in the South and in some of the Far Western States. In these areas many cities have in recent years amended their building codes as advocated by the Bureau of Entomology and now require adequate safeguards against termites in new construction.

"Salesmen, however, have been exaggerating the danger from termites in an effort to sell treatments, many of which have little or no merit, but which they picture as absolutely necessary to prevent the collapse within a short time of buildings invaded or under alleged danger of being invaded by the termites.

"The Bureau of Entomology says that there has been no change in the situation in the South and West as to termite damage; that conditions are substantially the same now as they have been for the last 50 to 100 years. The records indicate that the collapse of a building on account of termite damage is so rare as to be for practical purposes a negligible risk. It is true that where termites have been in buildings for many years—as indicated by emerging swarms of the winged forms—the foundation timbers, and even the floors and adjacent woodwork, may have become so weakened as to make necessary some replacement.

"The entomologists point out that an experience of 35 years in termite control indicates that radical reconstruction of the foundations is the only permanent and effective remedy for buildings which, because of original faulty construction, have become heavily infested. Such remedial measures as spraying or fumigation, or even removal of the worst infested timbers, without other protection, are at best temporary. *Spraying and fumigation are practically useless.*

"One of the popular remedies being exploited is the spraying of woodwork with poisons. Spraying of construction timbers or other woodwork, even under a forced stream, is of no real value. The poison has little if any penetration unless the timbers are so badly eaten and rotted that they soak up the mixture like a sponge—in which case they are useless and should be replaced.

"Another exploited remedy is the poisoning of soil near the foundation walls or supporting pillars underneath the buildings. All that can be said now of such treatment is that it is still very much in the experimental stage. On present information the Federal entomologists can not recommend it as a permanent remedy.

"The only effective remedy for termite damage is to provide termite-proof materials for foundations. This can be done in two ways:

"(1) Reconstruct the foundation walls, including cellar and cellar floors, of concrete and stone, using standard mortar; thoroughly fill all openings in masonry or tile construction; and use, where necessary, mechanical barriers, such as metal termite shields. With this protection against entry, movable woodwork placed in such basements and the woodwork of the main and upper floors can be fully and adequately protected from termite damage.

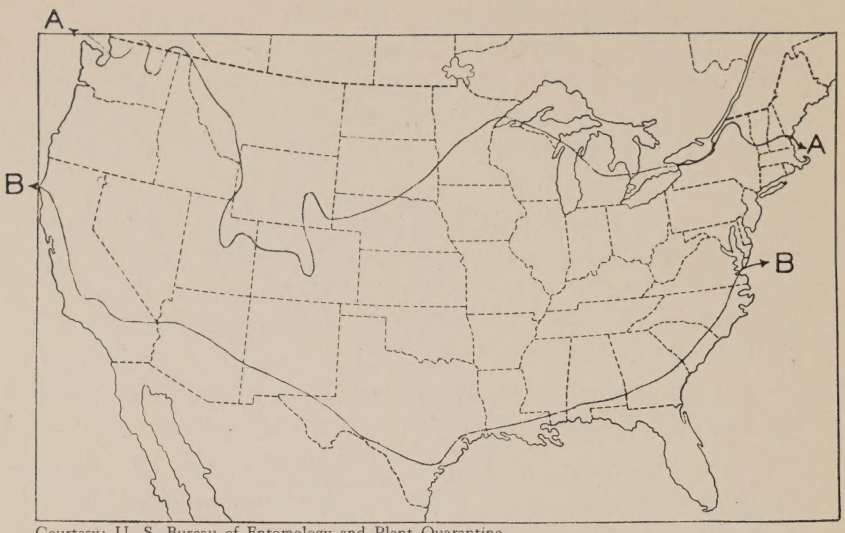
"(2) Where in the construction of buildings it is desirable or necessary to use wood touching the ground or near it, this wood and all foundation timbers should be impregnated in an approved manner by one of the standard chemical wood preservatives.

"These are the essentials of termite proofing in new construction. In their own interest, house owners are cautioned not to accept any new or easy methods, such as fumigation or spraying of woodwork in place, or soil poisoning, for the control or elimination of termites, until they have assured themselves of the effectiveness of the method by asking advice either from their own State Department of Agriculture or other competent State authorities, or from the Bureau of Entomology in Washington."

Methods for Preventing Termite Attack

Termite damage to new buildings can be easily prevented by following certain simple rules of construction. Termites which have infested buildings already constructed can likewise be readily eradicated. The services of an expert are seldom required.

The principle involved in the prevention or elimination of termite attack is the insulation of all untreated wood from contact with the ground or from



Courtesy: U. S. Bureau of Entomology and Plant Quarantine.

Map showing (line A-A) the northern limit of damage done by subterranean termites in the United States and (line B-B) the northern limit of damage done by dry-wood or non-subterranean termites.

indirect accessibility to the termites through cracks in concrete or masonry walls, foundations, piers, pillars or basement floors with which the untreated wood is in contact. Observance of the following simple rules will prevent or eliminate termite attack in buildings.

CONSTRUCTION OF NEW BUILDINGS

Preparation of Building Site

If the building is to be erected in areas heavily infested with termites or in recently cleared woodland, all logs and stumps should be removed and burned. If the soil is infested with termites it should be plowed deeply and treated with crude ortho-dichlor-benzene at the rate of 50 gallons per 1000 square feet or with creosote thinned with kerosene.

Foundation and Basement Construction

1. Basement floors should be of concrete. The base of the floor should be made with a 1:3:6 mixture of cement, sand and 2 inch washed gravel or stone laid at least 3 inches thick. Before this base has set apply a smooth top dressing of 2:3 mixture of cement and fine sand, one inch thick.

Damage to Oak Flooring by Subterranean Termites. Upper part of Flooring Shows no Evidence of the Damage.

2. The basement walls should be made of concrete, brick with cement mortar or stone with cement mortar, and should extend at least 6 inches above the ground and preferably higher. If plastering is applied inside, all wood studding, lath and all other unexposed wood should be treated with a salt preservative.

3. While wooden pillars, partitions, door casings, stairs, etc., may generally be safely installed on a good concrete floor of this type the safest practice is not to depend upon perfection in the concrete. Wood pressure treated with creosote or salts should be used, or, if untreated wood is used for this purpose, it should be placed on concrete footings or extensions rising about 6 inches above and continuous with the floor.

4. Frequently wooden beams, blinds, leaders or sleepers are imbedded or laid in concrete before it sets. Imperfections below the wood members in such construction invites termite attack and this is one of the most common sources of infestation. Pressure treated wood should be used for this purpose or the grooves should be formed and the concrete allowed to set before installing untreated wood.

5. Window and door frames or casings in exterior walls of the basement should be not less than 6 inches and preferably higher above ground. All structural wood members within 18 inches of the ground should be treated either with creosote or with a salt preservative.

6. If no basement is to be excavated under the building, the foundations, posts, piers, etc., may be either of pressure creosoted wood, concrete or masonry construction. No untreated wood should be installed within 18 inches of the ground. Elevation or excavation should be made to secure this distance. It is preferable in this type of building to use pressure treated wood for all lumber up to and including the first sub-floor, for protection against rot as well as termites. Stairs should

be mounted on concrete or pressure creosoted wood footings. Ventilation openings on the basis of 2 square feet per 25 lineal feet of wall should be provided under the building. A similar procedure for porches and for all other extensions from the main buildings should be followed.

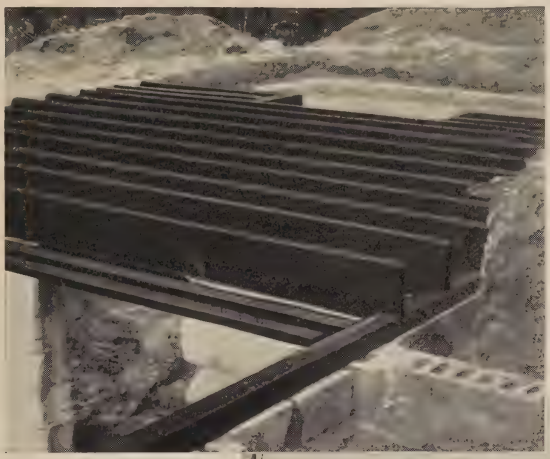
Protective Shields

In severely infested areas, generally confined to the South, termites sometimes build shelter tubes over concrete or treated wood foundations in order to reach untreated wood above. This means of infestation may be effectively prevented by inserting metal shields of copper, zinc or stainless steel between the concrete, masonry or treated wood foundations, piers, etc., and the untreated wood above. These shields are preferably cemented in foundations of concrete or masonry. If they are placed on top of the foundations, etc., the ends of each section should be overlapped and soldered. The shields should project horizontally for at least 2 inches beyond which an additional 2 inches should be turned down at an angle of about 45 degrees. Shields should also be soldered to pipes extending through basement floors, below the untreated wood or they may be cemented in the concrete floor at the time it is laid.

Termites, Gaining Access Through Wooden Spreader Stick in Concrete Foundation, Have Built Their Shelter Tubes Upward to the Untreated Timber Joist.

Soil Poisoning

A temporary and less effective method of preventing infestation through termite shelter tubes built over the foundations, etc., is to poison all soil in contact with all parts of the building. A trench at least 30 inches deep should be excavated against all exterior foundation walls, and internal walls which are against any unexcavated areas as well as around all piers and pillars. However, in no case should the excavation be below the top of any footings. While tests with various soil poisons have not been conducted long enough to definitely determine the best, it is now believed that crude ortho-dichlor-benzene is the most effective. Coal-tar Creosote is also effective for this purpose. This material should be applied at the rate of one gallon per 10 linear feet of wall in the bottom of the trench. Fill in the trench to within about 3 inches of the grade level and again apply the same amount of ortho-dichlor-benzene.



Creosoted Stringers and Understructure Timber for Residences. Resist Decay and Termite Attack.

Salt-treated Sub-flooring Being Laid Over Creosoted joists.

"Sunlight" All-wood Home—Century of Progress, Chicago

Footings, sills, floor joists and sub-flooring preservatively treated by the pressure process.

Courtesy: U. S. Bureau of Entomology and Plant Quarantine.

Termites may add considerably to the cost of an improperly constructed building

ERADICATION OF TERMITES IN EXISTING BUILDINGS

Indications of Termite Presence

The presence of termites in a building is generally indicated by one or both of two ways. (1) Flying or swarming of the winged adults from the buildings. (2) Presence of the cartonlike shelter tubes built from the ground over walls or foundations or rising directly from the ground to nearby overhead untreated wood. If the termite damage has progressed far enough this may be indicated by sagging of floors or other parts of the building. Frequently, only very careful inspection will reveal the presence of termites, especially if they can make direct access to the building through untreated wood in contact with the ground or through soft mortar or crevices in the foundation walls. Such points should always be carefully inspected by digging into those parts of the structure.

Observance of the following rules, where they apply to the construction involved, will remedy the trouble. The methods of "termite-proofing" existing buildings are essentially the same as those outlined above for the construction of new buildings.

If the proper remedial measures have been taken, there should be no concern over termites in the building even though they have penetrated as far as the third floor. When contact with the ground is prevented, they will soon shrivel

up and die before they can do further appreciable damage. Of course, if some of the structural timbers have been seriously weakened, they should be replaced.

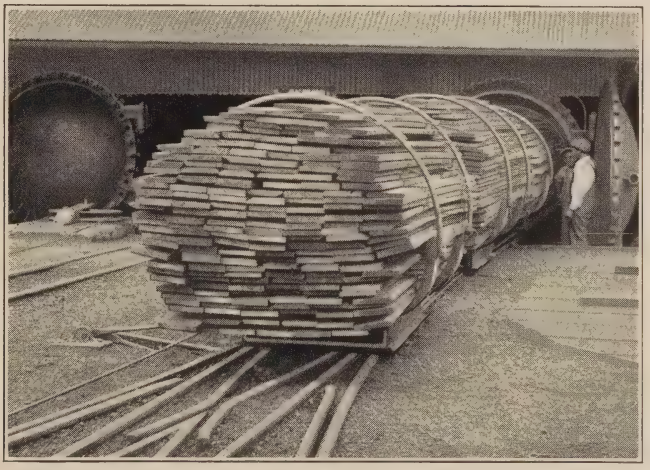
Foundation and Basement Reconstruction

1. If the basement floor is not concreted, remove or cut off from contact with the floor all untreated wood such as flooring, partitions, base-boards, stairs, coal bins, uprights and door casings at least 6 inches above the floor. Then lay a concrete floor as described above under Construction of New Buildings.

2. If a plaster wall exists against the basement wall, cut away all plaster, studs or stripping to a height of at least 6 inches above the floor and construct a concrete base tight against the exterior wall, continuous with the floor and flush with the face of the plaster.

3. Any untreated wood, such as partitions, base-boards, stairs, coal bins and door casings which have been cut off may be supported by footings or extensions rising from the concrete floor and continuous with it, uprights may be supported on cast iron bases, or, preferably all untreated wood in the basement should be replaced with wood pressure treated with a salt preservative.

4. Any wooden blinds, leaders or sleepers imbedded in previously installed concrete floors or walls should be removed and replaced with wood pressure treated with a salt preservative, or, construction should be



Selected Lumber Entering Retort for Preservative Pressure Treatment

changed to insulate the ends and sides of these timbers from the ground contact by a dense cement concrete which is allowed to set before installation of the timbers.

5. Where soft mortar or cracks in foundations, walls, piers, pillars, etc., are permitting penetration by termites, the upper layer of brick or other masonry should be removed, a small section at a time, and relaid with cement mixture of 1:3 cement and sand to which is added 10 per cent lime based on volume of the cement. If wood is in contact with the wall it should be temporarily removed and the soft or crumbling mortar should be raked out of the old joints to a depth of at least ½ inch, from the basement floor to the top of the foundation or pier. Two coats of the same cement mixture should be applied to a thickness of 1 inch preferably also on the outside of the wall.

6. Basement window and door frames and casings in the exterior walls, level with or below the ground should be replaced with pressure treated wood, or, the exterior earth grade should be lowered to at least 6 inches below the wood casing, or, the bottom of the opening in the wall should be raised to at least 6 inches above grade by building up with cement mortar, installing a smaller window if a compensated raising of the top of the opening cannot be made.

7. If there is no basement under the building, excavate, if necessary, to secure a distance of at least 18 inches from the bottom of the floor joists to the ground. Replace any untreated wood timber foundations or posts with pressure creosoted wood or concrete construction. A similar procedure for porches or other extensions of the building should be followed. Ventilation should be provided as stated above under Construction of New Buildings.

Insertion of Protective Shields

The advisability and method of inserting protective metal shields apply to the termite-proofing of existing buildings the same as under Construction of New Buildings.

Courtesy: U. S. Bureau of Entomology and Plant Quarantine.

Termite Tubes Hanging from Joists and Flooring in a Basement. Construction is Concrete Pillars Supporting Steel Beams which Support Timber Floor Joists which Support Flooring. Such Tubes are About One-Half Inch in Diameter and Sometimes over Four Feet Long.

Courtesy: U. S. Bureau of Entomology and Plant Quarantine.

Termite Tubes Built From the Ground Over Vertical Concrete Foundation Wall.

RECOMMENDATIONS FOR USE OF PRESSURE TREATED LUMBER FOR RECONSTRUCTION OR NEW BUILDINGS

The proper use of pressure treated wood below the first floor in residences and other buildings will give protection against termites. Its use is practical and economical.

A special committee of the American Wood-Preservers' Association headed by Mr. Geo. M. Hunt of the U. S. Forest Products Laboratory, made a recommendation for the use of treated wood, as follows:

"In sections of the country where termite damage has been extensive, particularly from subterranean termite activity, it is the conclusion of investigators that all timber up to and including the first-floor sub-floor should be protected. Impregnation of such timber by a pressure process according to the standards of the American Wood-Preservers' Association, using coal tar creosote, is recommended by these authorities to obtain economical and efficient protection.

'Similar measures are recommended to prevent fungus damage in building construction regardless of the district in which the building is erected, the necessity for protection depending on the closeness of wood construction to the ground or other sources of moisture sufficient to sustain fungus growth. The use of creosote impregnated timber likewise ranks highest in recommendations for the prevention of fungus damage in wood construction."

The practicability of using treated wood in buildings is attested by an ordinance of the City of Los Angeles, by which the use of wood treated under pressure with Creosote or Wolman Salts is mandatory. Excerpts from that ordinance follow:

"Mudsills, caps, pier blocks, posts, cross-bridging, girders, and first floor joists, and for the purpose of this section, all lumber used in the underpinning up to but not including the sub-floor shall be treated with Pure Coal-Tar Creosote, or with such other equivalent preservative as may be approved by the Board of Building and Safety Commissioners. . . . .

'The wood shall be treated by the empty cell pressure process of not less than eight (8) pounds per cubic foot of material treated, in accordance with the best practice of the Creosoting Industry, or shall be treated with such other equivalent preservative as may be approved and specified by the Board of Building and Safety Commissioners.

'Whenever it is necessary to cut, notch, cap or frame treated lumber, such surfaces shall be thoroughly painted with such creosote or other equivalent approved preservative."

Other investigations have shown that the proper use of pressure salt treated wood in locations where creosoted wood is undesirable will likewise prevent termite attack. By joint use of creosoted and salt treated wood, complete protection can be secured without any special design for construction of buildings.

Pressure treatment is of vital importance with any wood used in contact with or near the ground and not insulated from it by concrete, concrete-masonry or

shields. For maximum protection, pressure treated wood is recommended in new construction or in reconstruction of residences, apartments, churches, clubs, commercial and industrial buildings, factories, garages, gymnasiums, hotels, schools, warehouses, etc., for prevention of termite attack, as follows:

1. FOR BUILDINGS WITHOUT BASEMENTS AND FOR PORCHES AND OTHER EXTENSIONS WITHOUT BASEMENTS.

   (a) Pressure Creosote Treatment[1] of:—
   Foundation timbers in contact with ground.
   Supporting posts, pillars and footings in contact with ground.

   (b) Pressure Salt Treatment of:—
   Stairs.
   Partitions below first floor.
   Siding up to 18 inches above ground.
   Lattices.
   First floor joists.
   First sub-floor.
   Sleepers, leaders and plates embedded in or laid on concrete or concrete-masonry foundations or walls.
   All other structural timbers within 18 inches of the ground.

2. FOR BUILDINGS WITH BASEMENTS WITH CONCRETE OR CONCRETE-MASONRY WALLS.

   Pressure Salt Treatment[2] of:—
   All wood used in basement:
   Stairs Door and window casings Partitions Coal Bins Studding Lath.
   Sleepers, leaders, plates and joists imbedded in or laid on concrete or masonry.
   All structural timbers within 18 inches of the ground.

Cutting of the treated timbers or lumber should be avoided as much as possible by purchasing material in the correct sizes ready for installation. Where cutting is unavoidable, the cut surfaces should be thoroughly swabbed with two coats of the hot preservative solution, the second coat being applied after the first has thoroughly dried.

NOTE:—

[1] Grade 1 Creosote meeting specifications of the American Wood Preservers' Association and injected by one of the standard approved pressure processes prescribed by the American Wood-Preservers' Association.

[2] Wolman Salts, Zinc Chloride or Chromated Zinc Chloride preservative solutions *injected by one of the standard approved pressure treatment or processing methods* prescribed by the American Wood-Preservers' Association. After treatment the lumber should be kiln-dried to correct moisture content or thoroughly air-dried.

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